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<b>(54) Title:</b> CONDITIONING SHAMPOO COMPOSITIONS CONTAINING EMULSION POLYMERIZED POLYMERS  <b>(57) Abstract</b>  Disclosed are shampoo compositions which comprise from about 5 % to about 50 % by weight of an anionic detergent surfactant, from about 0.025 % to about 3 % by weight of an organic, cationic deposition polymer, from about 0.01 % to about 10 % by weight of an emulsion polymerized silicone wherein the polymer is derived from the polymerization of linear dimethylpolysiloxane monomers, and from about 20 % to about 94 % by weight water. The composition provides improved conditioning benefits such as wet and dry combing, and dry hair feel with minimal suppression of the shampoo lather.		

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## CONDITIONING SHAMPOO COMPOSITIONS CONTAINING EMULSION POLYMERIZED POLYMERS

### FIELD OF THE INVENTION

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This invention relates to conditioning shampoo compositions which contain select emulsion polymerized silicone polymers which are derived from the emulsion polymerization of linear dimethylpolysiloxane monomers.

### BACKGROUND OF THE INVENTION

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Conditioning shampoos comprising various combinations of deterative surfactant and hair conditioning agents are known. These shampoo products typically comprise an anionic deterative surfactant in combination with a conditioning agent such as silicone, hydrocarbon oil, fatty esters, or combinations thereof. These shampoos have become more popular among consumers as a means of conveniently obtaining hair conditioning and hair cleansing performance all from a single hair care product.

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While a wide variety of shampoos have been disclosed which contain conditioning aids, they have not been totally satisfactory for a variety of reasons. Cationic conditioning agents are highly desirable for use in hair conditioning due to their abilities to control static, improve wet detangling, and provide a silky wet hair feel to the user. One problem which has been encountered in shampoos relates to compatibility problems between good cleaning anionic surfactants and the many conventional cationic agents which historically have been used as conditioning agents. Efforts have been made to minimize adverse interaction through the use of alternate surfactants and improved cationic conditioning agents. Cationic surfactants which provide good overall conditioning in hair rinse products, in general, tend to complex with anionic cleaning surfactants and provide poor conditioning in a shampoo context. In particular, the use of soluble cationic surfactants that form soluble ionic complexes do not deposit well on the hair. Soluble cationic surfactants that form insoluble ionic complexes deposit on the hair but do not provide good hair conditioning benefits, and tend to cause the hair to have a dirty, coated feel. The use of insoluble cationic surfactants, e.g., tricetyl methyl ammonium chloride, can provide excellent anti-static benefits but do not otherwise provide good overall conditioning. Many cationic polymers tend to build up on the hair to result in an undesirable, "unclean" coated feel. Cationic polymers therefore, conventionally, are preferably used at limited levels to minimize this problem. This, however, can limit the overall conditioning benefits that are obtained. Additionally, cationic conditioning agents commonly do not provide

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optimal overall conditioning benefits, particularly in the area of "softness", especially when delivered as an ingredient in a shampoo composition.

Materials which can provide increased softness are nonionic silicones. Silicones in shampoo compositions have been disclosed in a number of different publications. Such publications include  
5 U.S. Patent 2,826,551, Geen, issued March 11, 1958; U.S. Patent 3,964,500, Drakoff, issued June 22, 1976; U.S. Patent 4,364,837, Pader, issued December 21, 1982; and British Patent 849,433, Woolston, issued September 28, 1960. While these patents disclose silicone containing compositions, they also did not provide a totally satisfactory product in that it was difficult to maintain the silicone well dispersed and suspended in the product. Recently, stable, insoluble  
10 silicone-containing hair conditioning shampoo compositions have been described in U.S. Patent 4,741,855, Grote and Russell, issued May 3, 1988 and U.S. Patent 4,788,066, Bolich and Williams, issued November 29, 1988. These shampoo compositions can deliver excellent overall conditioning benefits to the hair while maintaining excellent cleaning performance, even with the use of anionic  
15 deterative surfactants, for a wide variety of hair types.

More recently, improved conditioning shampoos were provided in U.S. Serial No. 07/622,699, Robert L. Wells, filed December 5, 1990, now abandoned, and its continuation application Serial No. 07/778,765, filed October 21, 1991, wherein shampoos containing anionic surfactant, dispersed, insoluble silicone, and certain relatively low ionic strength cationic polymers (greater than about 0.4 meq./gm) were disclosed. These compositions provide excellent hair  
20 cleaning conditioning to a wide variety of hair types, especially including improved conditioning to hair damaged by color treatments, bleaching, permanents, etc.

Japanese Patent Application, Laid Open No. 56-72095, June 16, 1981, Hirota et al. (Kao Soap Corp.) also discloses shampoo containing cationic polymer and silicone conditioning agents. Still other patent publications relating to shampoos with cationic agents and silicone include EPO  
25 Application Publication 0 413 417, published February 20, 1991, Hartnett et al.

Another approach to providing hair conditioning benefits to shampoo compositions has been to use materials which are oily to the touch. These materials provide improved luster and shine to the hair. Oily materials have also been combined with cationic materials in the shampoo formulations. Japanese Patent Application Showa 53-35902, laid open October 6, 1979 (Showa 54-  
30 129135), N. Uchino (Lion Yushi Co.), discloses hair treatment compositions containing cationic polymer, fatty acid salt, and at least 10% of an oily component for use before or after shampooing. Suitable oily components are hydrocarbons, higher alcohols, fatty acid esters, glycerides, and fatty acids. Japanese Patent Application 62 [1987]-327266, filed December 25, 1987, published July 4, 1989, laid open No. HEI 1[1987]-168612, Horie et al., discloses detergent compositions containing  
35 cationic surfactant and/or cationic polymer, anionic surfactant, and specific esters of the formula  $\text{RCOOR}'$  wherein R and R' are straight or branched chain alkyls.

In spite of these attempts to provide optimal combinations of cleaning ability and hair conditioning, it remains desirable to provide further improved hair conditioning shampoo compositions. For instance, it remains desirable to improve overall conditioning, and especially shine and luster, wet and dry combing, and dry hair feel, of hair treated with shampoo containing  
5 silicone and cationic material. For shampoos containing oily materials in combination with cationic materials, it remains desirable to improve overall conditioning, especially wet combing and detangling, dry combing, and dry hair feel. However merely increasing the level of one or both conditioning ingredients can result in adverse effects such as greasy hair feel and loss of fullness. It is desirable to improve conditioning without suffering from these drawbacks.

10 One attempt to do this is disclosed in WO 95/09599, published April 13, 1995, Murray et al., which is incorporated herein by reference. This patent discloses a shampoo composition containing a cationic polymer deposited in soluble silicone oils, especially dimethiconol. These systems are most effective, e.g., provide uniform deposition of the conditioning agents onto hair, when the silicone is emulsion polymerized and the average particle size of the emulsion polymerized polymer is less than  
15 2 $\mu$ m, preferably less than 1 $\mu$ m.

The addition of silicone oils to conditioning shampoo compositions in the form of aqueous emulsions is known in the art. Conventional silicone emulsion processes include emulsions formed by mechanical shearing of the silicone oil, as well as emulsion polymerization. Both procedures provide emulsion systems in which the particle size of the silicone oils in the emulsion is less than  
20 about 2 $\mu$ m, preferably less than about 1 $\mu$ m, more preferably less than about 0.5 $\mu$ m, even more preferably less than about 0.3 $\mu$ m, even more preferably less than about 0.15 $\mu$ m, and most preferably less than about 0.1 $\mu$ m. The particle size of silicone emulsified oils are typically greater than about 0.01 $\mu$ m.

25 However, emulsion polymerized silicone emulsions now have inherently provided better control of particle size in the production of high viscosity fluids and microemulsions. Submicron mechanical emulsions of silicone having a viscosity greater than 60,000 centistokes is very difficult to manufacture. Since emulsion polymerization allows greater ease in the production of viscosities greater than 60,000 centistokes, the industry has migrated toward the use of emulsion polymerization for the production of such high viscosity submicron silicone emulsions.

30 It has now been found that emulsion polymerized silicone emulsions which are made using cyclic silicones can negatively impact lather of conditioning shampoo compositions. However, silicone emulsions derived from the polymerization of linear dimethylpolysiloxanes are able to be added to conditioning shampoo compositions with minimal lather suppression. One hypothesis can be that the residual cyclic silicone leaches from the emulsion phase to the surfactant phase and acts as  
35 an antifoam or soil load, thereby reducing lather performance.

It has also been found that emulsion polymerized silicones wherein the polymer is derived from the polymerization of linear dimethylpolysiloxane monomers having the formula: HO-[Si

$(R^1R^2-O)_n-H$  wherein  $n$  is greater than about 10 do not exhibit the negative impact on lather of conditioning shampoo compositions. This is achieved because of a higher completeness of the reaction, and the dimethiconol starting material is of sufficient molecular weight to prevent minimal leaching into the surfactant phase.

It is therefore an object of the present invention to provide a conditioning shampoo composition for use on hair or skin with improved conditioning performance, and further to provide such a composition with improved uniform deposition of conditioning agents onto hair or skin, and further to provide such a composition which utilizes dimethylpolysiloxane emulsions derived from the emulsion polymerization of linear dimethylpolysiloxane monomers.

#### SUMMARY OF THE INVENTION

The present invention is directed to hair conditioning shampoo compositions which comprise

(A) from about 5% to about 50% by weight of an anionic surfactant component selected from the group consisting of anionic surfactants, zwitterionic and amphoteric surfactants, said zwitterionic and amphoteric surfactants having an attached group that is anionic at the pH of the composition, and combinations thereof;

(B) from about 0.025% to about 3% by weight of an organic, cationic, deposition polymer having a cationic charge density of from about 0.2 meq/g to about 5 meq/g and an average molecular weight of from about 5,000 to about 10,000,000;

(C) from about 0.005% to about 10% by weight of an emulsion polymerized silicone wherein the polymer is derived from the polymerization of linear dimethylpolysiloxane monomers having the formula:



wherein  $n$  is from about 10 to about 100, and

(D) from about 20% to about 94% by weight of water.

#### DETAILED DESCRIPTION OF THE INVENTION

The shampoo compositions of the present invention can comprise, consist of, or consist essentially of the essential elements and limitations of the invention described herein, as well any of the additional or optional ingredients, components, or limitations described herein.

All percentages, parts and ratios are based on the total weight of the shampoo compositions of the present invention, unless otherwise specified. All such weights as they pertain to listed ingredients are based on the active level and, therefore, do not include carriers or by-products that may be included in commercially available materials, unless otherwise specified.

As used herein, the term "soluble" refers to materials that are sufficiently soluble in water to form a substantially clear solution to the naked eye at a concentration of 0.1% by weight of the material in water at 25°C. Conversely, the term "insoluble" refers to all other materials that are

therefore not sufficiently soluble in water to form a substantially clear solution to the naked eye at a concentration of 0.1% by weight of the other material in water at 25°C.

As used herein, "nonvolatile" refers to any material having little or no significant vapor pressure under ambient conditions, and a boiling point under one atmosphere (atm) preferably at least about 250°C. The vapor pressure under such conditions is preferably less than about 0.2 mm Hg at 25°C or less, preferably less than about 0.1 mm Hg at 25°C or less.

The shampoo compositions of the present invention, including the essential and some optional components thereof, are described in detail hereinafter.

#### Anionic Detergent Surfactant Component

The shampoo compositions of the present invention comprise an anionic detergent surfactant component to provide cleaning performance to the composition. The anionic detergent surfactant component in turn comprises anionic detergent surfactant, zwitterionic or amphoteric detergent surfactant which has an attached group that is anionic at the pH of the composition, or a combination thereof, preferably anionic detergent surfactant. Such surfactants should be physically and chemically compatible with the essential components described herein, or should not otherwise unduly impair product stability, aesthetics or performance.

Suitable anionic detergent surfactant components for use in the shampoo composition herein include those which are known for use in hair care or other personal care cleansing compositions. The concentration of the anionic surfactant component in the shampoo composition should be sufficient to provide the desired cleaning and lather performance, and generally range from about 5% to about 50%, preferably from about 8% to about 30%, more preferably from about 10% to about 25%, even more preferably from about 12% to about 18%, by weight of the composition.

Preferred anionic surfactants suitable for use in the shampoo compositions are the alkyl and alkyl ether sulfates. These materials have the respective formulae  $\text{ROSO}_3\text{M}$  and  $\text{RO}(\text{C}_2\text{H}_4\text{O})_x\text{SO}_3\text{M}$ , wherein R is alkyl or alkenyl of from about 8 to about 18 carbon atoms, x is an integer having a value of from 1 to 10, and M is a cation such as ammonium, alkanolamines, such as triethanolamine, monovalent metals, such as sodium and potassium, and polyvalent metal cations, such as magnesium, and calcium. The cation M should be selected such that the anionic detergent surfactant component is water soluble. Solubility of the surfactant will depend upon the particular anionic detergent surfactants and cations chosen.

Preferably, R has from about 8 to about 18 carbon atoms, more preferably from about 10 to about 16 carbon atoms, even more preferably from about 12 to about 14 carbon atoms, in both the alkyl and alkyl ether sulfates. The alkyl ether sulfates are typically made as condensation products of ethylene oxide and monohydric alcohols having from about 8 to about 24 carbon atoms. The alcohols can be synthetic or they can be derived from fats, e.g., coconut oil, palm kernel oil, tallow. Lauryl alcohol and straight chain alcohols derived from coconut oil or palm kernel oil are preferred. Such alcohols are reacted with between about 0 and about 10, preferably from about 2 to about 5,

more preferably about 3, molar proportions of ethylene oxide, and the resulting mixture of molecular species having, for example, an average of 3 moles of ethylene oxide per mole of alcohol, is sulfated and neutralized.

Specific non limiting examples of alkyl ether sulfates which may be used in the shampoo compositions of the present invention include sodium and ammonium salts of coconut alkyl triethylene glycol ether sulfate, tallow alkyl triethylene glycol ether sulfate, and tallow alkyl hexaoxyethylene sulfate. Highly preferred alkyl ether sulfates are those comprising a mixture of individual compounds, wherein the compounds in the mixture have an average alkyl chain length of from about 10 to about 16 carbon atoms and an average degree of ethoxylation of from about 1 to about 4 moles of ethylene oxide.

Other suitable anionic deterative surfactants are the water-soluble salts of organic, sulfuric acid reaction products conforming to the formula  $[R^1-SO_3-M]$  where  $R^1$  is a straight or branched chain, saturated, aliphatic hydrocarbon radical having from about 8 to about 24, preferably about 10 to about 18, carbon atoms; and M is a cation described hereinbefore. Non limiting examples of such deterative surfactants are the salts of an organic sulfuric acid reaction product of a hydrocarbon of the methane series, including iso-, neo-, and n-paraffins, having from about 8 to about 24 carbon atoms, preferably about 12 to about 18 carbon atoms and a sulfonating agent, e.g.,  $SO_3$ ,  $H_2SO_4$ , obtained according to known sulfonation methods, including bleaching and hydrolysis. Preferred are alkali metal and ammonium sulfonated  $C_{10}$  to  $C_{18}$  n-paraffins.

Still other suitable anionic deterative surfactants are the reaction products of fatty acids esterified with isethionic acid and neutralized with sodium hydroxide where, for example, the fatty acids are derived from coconut oil or palm kernel oil; sodium or potassium salts of fatty acid amides of methyl tauride in which the fatty acids, for example, are derived from coconut oil or palm kernel oil. Other similar anionic surfactants are described in U.S. Patent 2,486,921; U.S. Patent 2,486,922; and U.S. Patent 2,396,278, which descriptions are incorporated herein by reference.

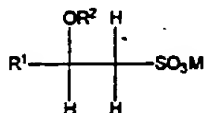
Other anionic deterative surfactants suitable for use in the shampoo compositions are the succinates, examples of which include disodium N-octadecylsulfosuccinnate; disodium lauryl sulfosuccinate; diammonium lauryl sulfosuccinate; tetrasodium N-(1,2-dicarboxyethyl)-N-octadecylsulfosuccinnate; diamyl ester of sodium sulfosuccinic acid; dihexyl ester of sodium sulfosuccinic acid; and dioctyl esters of sodium sulfosuccinic acid.

Other suitable anionic deterative surfactants include olefin sulfonates having about 10 to about 24 carbon atoms. In this context, the term "olefin sulfonates" refers to compounds which can be produced by the sulfonation of alpha-olefins by means of uncomplexed sulfur trioxide, followed by neutralization of the acid reaction mixture in conditions such that any sulfones which have been formed in the reaction are hydrolyzed to give the corresponding hydroxy-alkanesulfonates. The sulfur trioxide can be liquid or gaseous, and is usually, but not necessarily, diluted by inert diluents, for example by liquid  $SO_2$ , chlorinated hydrocarbons, etc., when used in the liquid form, or by air,



nitrogen, gaseous  $\text{SO}_2$ , etc., when used in the gaseous form. The alpha-olefins from which the olefin sulfonates are derived are mono-olefins having from about 10 to about 24 carbon atoms, preferably from about 12 to about 16 carbon atoms. Preferably, they are straight chain olefins. In addition to the true alkene sulfonates and a proportion of hydroxy-alkanesulfonates, the olefin sulfonates can contain minor amounts of other materials, such as alkene disulfonates depending upon the reaction conditions, proportion of reactants, the nature of the starting olefins and impurities in the olefin stock and side reactions during the sulfonation process. A non limiting example of such an alpha-olefin sulfonate mixture is described in U.S. Patent 3,332,880, which description is incorporated herein by reference.

- 10 Another class of anionic deterative surfactants suitable for use in the shampoo compositions are the beta-alkyloxy alkane sulfonates. These surfactants conform to the formula



- where  $\text{R}^1$  is a straight chain alkyl group having from about 6 to about 20 carbon atoms,  $\text{R}^2$  is a lower alkyl group having from about 1 to about 3 carbon atoms, preferably 1 carbon atom, and M is a water-soluble cation as described hereinbefore.

- Preferred anionic deterative surfactants for use in the shampoo compositions include ammonium lauryl sulfate, ammonium laureth sulfate, triethylamine lauryl sulfate, triethylamine laureth sulfate, triethanolamine lauryl sulfate, triethanolamine laureth sulfate, monoethanolamine lauryl sulfate, monoethanolamine laureth sulfate, diethanolamine lauryl sulfate, diethanolamine laureth sulfate, lauric monoglyceride sodium sulfate, sodium lauryl sulfate, sodium laureth sulfate, potassium lauryl sulfate, potassium laureth sulfate, sodium lauryl sarcosinate, sodium lauroyl sarcosinate, lauryl sarcosine, cocoyl sarcosine, ammonium cocoyl sulfate, ammonium lauroyl sulfate, sodium cocoyl sulfate, sodium lauroyl sulfate, potassium cocoyl sulfate, potassium lauryl sulfate, triethanolamine lauryl sulfate, triethanolamine lauryl sulfate, monoethanolamine cocoyl sulfate, monoethanolamine lauryl sulfate, sodium tridecyl benzene sulfonate, sodium dodecyl benzene sulfonate, and combinations thereof.

- Suitable amphoteric or zwitterionic deterative surfactants for use in the shampoo composition herein include those which are known for use in hair care or other personal care cleansing composition, and which contain a group that is anionic at the pH of the shampoo composition. Concentration of such amphoteric deterative surfactants preferably ranges from about 0.5 % to about 20%, preferably from about 1% to about 10%, by weight of the composition. Non limiting examples of suitable zwitterionic or amphoteric surfactants are described in U.S. Patents 5,104,646 (Bolich Jr. et al.), U.S. Patent 5,106,609 (Bolich Jr. et al.), which descriptions are incorporated herein by reference.

Amphoteric deterative surfactants suitable for use in the shampoo composition are well known in the art, and include those surfactants broadly described as derivatives of aliphatic secondary and tertiary amines in which the aliphatic radical can be straight or branched chain and wherein one of the aliphatic substituents contains from about 8 to about 18 carbon atoms and one  
5 contains an anionic water solubilizing group such as carboxy, sulfonate, sulfate, phosphate, or phosphonate.

Zwitterionic deterative surfactants suitable for use in the shampoo composition are well known in the art, and include those surfactants broadly described as derivatives of aliphatic quaternary ammonium, phosphonium, and sulfonium compounds, in which the aliphatic radicals can  
10 be straight or branched chain, and wherein one of the aliphatic substituents contains from about 8 to about 18 carbon atoms and one contains an anionic group such as carboxy, sulfonate, sulfate, phosphate or phosphonate. Zwitterionics such as betaines are preferred.

The shampoo compositions of the present invention may further comprise additional surfactants for use in combination with the anionic deterative surfactant component described  
15 hereinbefore. Suitable optional surfactants include nonionic surfactants, cationic surfactants, and combinations thereof. Any such surfactant known in the art for use in hair or personal care products may be used, provided that the optional additional surfactant is also chemically and physically compatible with the essential components of the shampoo composition, or does not otherwise unduly impair product performance, aesthetics or stability. The concentration of the optional additional  
20 surfactants in the shampoo composition may vary with the cleansing or lather performance desired, the optional surfactant selected, the desired product concentration, the presence of other components in the composition, and other factors well known in the art.

Non limiting examples of other anionic, zwitterionic, amphoteric or optional additional surfactants suitable for use in the shampoo compositions are described in McCutcheon's, Emulsifiers  
25 and Detergents, 1989 Annual, published by M. C. Publishing Co., and U.S. Patent 3,929,678, U.S. Patent 2,658,072; U.S. Patent 2,438,091; U.S. Patent 2,528,378, which descriptions are incorporated herein by reference.

#### Deposition Polymer

A deposition polymer is an essential element of the present invention. It will generally be  
30 present at levels of from 0.01 to 5%, preferably from about 0.05 to 1%, more preferably from about 0.08% to about 0.5% by weight. The polymer may be a homopolymer or be formed from two or more types of monomers. The molecular weight of the polymer will generally be between about 5,000 and about 10,000,000, preferably between about 50,000 and about 5,000,000, and most preferably in the range between about 100,000 to about 2,000,000. Preferably the deposition  
35 polymer is a cationic polymer and preferably will have cationic nitrogen containing groups such as quaternary ammonium or protonated amino groups, or a mixture thereof.

The cationic charge density has been found to need to be at least 0.1 meq/g, preferably above 0.5 and most preferably above 0.8 or higher. The cationic charge density should not exceed 5 meq/g, it is preferably less than 3 and more preferably less than 2 meq/g. The charge density can be measured using the Kjeldahl method and should be within the above limits at the desired pH of use, which will in general be from about 3 to 9 and preferably between 4 and 8.

The cationic nitrogen-containing group will generally be present as a substituent on a fraction of the total monomer units of the cationic polymer. Thus when the cationic polymer is not a homopolymer it can contain spacer non-cationic monomer units. Such polymers are described in the CTFA Cosmetic Ingredient Directory, 3rd edition.

Suitable cationic polymers include, for example, copolymers of vinyl monomers having cationic amine or quaternary ammonium functionalities with water soluble spacer monomers such as (meth)acrylamide, alkyl and dialkyl (meth)acrylamides, alkyl (meth)acrylate, vinyl caprolactone and vinyl pyrrolidine. The alkyl and dialkyl substituted monomers preferably have C1-C7 alkyl groups, more preferably C1-C3 alkyl groups. Other suitable spacers include vinyl esters, vinyl alcohol, maleic anhydride, propylene glycol and ethylene glycol.

The cationic amines can be primary, secondary or tertiary amines, depending upon the particular species and the pH of the shampoo. In general secondary and tertiary amines, especially tertiary, are preferred.

Amines substituted vinyl monomers and amines can be polymerized in the amine form and then converted to ammonium by quaternization.

Suitable cationic amino and quaternary ammonium monomers include, for example, vinyl compounds substituted with dialkyl aminoalkyl acrylate, dialkylamino alkylmethacrylate, monoalkylaminoalkyl acrylate, monoalkylaminoalkyl methacrylate, trialkyl methacryloxyalkyl ammonium salt, trialkyl acryloxyalkyl ammonium salt, dialkyl quaternary ammonium salts, and vinyl quaternary ammonium monomers having cyclic cationic nitrogen-containing rings such as pyridinium, imidazolium, and quaternized pyrrolidine, e.g., alkyl vinyl imidazolium, and quaternized pyrrolidine, e.g., alkyl vinyl imidazolium, alkyl vinyl pyridinium, alkyl vinyl pyrrolidine salts. The alkyl portions of these monomers are preferably lower alkyls such as the C<sub>1</sub>-C<sub>3</sub> alkyls, more preferably C<sub>1</sub> and C<sub>2</sub> alkyls.

Suitable amine-substituted vinyl monomers for use herein include dialkylaminoalkyl acrylate, dialkylaminoalkyl methacrylate, dialkylaminoalkyl acrylamide, and dialkylaminoalkyl methacrylamide, wherein the alkyl groups are preferably C<sub>1</sub>-C<sub>7</sub> hydrocarbyls, more preferably C<sub>1</sub>-C<sub>3</sub> alkyls.

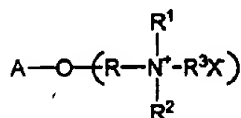
The cationic polymers hereof can comprise mixtures of monomer units derived from amine- and/or quaternary ammonium-substituted monomer and/or compatible spacer monomers.

Suitable cationic deposition polymers include, for example: copolymers of 1-vinyl-2-pyrrolidine and 1-vinyl-3-methyl-imidazolium salt (e.g., Chloride salt) (referred to in the industry by


the Cosmetic, Toiletry, and Fragrance Association, "CTFA" as Polyquaternium-16) such as those commercially available from BASF Wyandotte Corp. (Parsippany, NJ, USA) under the LUVIQUAT tradename (e.g., LUVIQUAT FC 370); copolymers of 1-vinyl-2-pyrrolidine and dimethylaminoethyl methacrylate (referred to in the industry by CTFA as Polyquaternium-11) such as those  
 5 commercially from ISP Corporation (Wayne, NJ, USA) under the GAFQUAT tradename (e.g., GAFQUAT 755N); cationic diallyl quaternary ammonium-containing polymers including, for example, dimethyldiallylammonium chloride homopolymer and copolymers of acrylamide and dimethyldiallylammonium chloride, referred to in the industry (CTFA) as Polyquaternium 6 and Polyquaternium 7, respectively; and mineral acid salts of amino-alkyl esters of homo- and co-  
 10 polymers of unsaturated carboxylic acids having from 3 to 5 carbon atoms, as described in U.S. Patent 4,009,256, incorporated herein by reference.


Other cationic polymers that can be used include polysaccharide polymers, such as cationic cellulose derivatives and cationic starch derivatives. Cationic polysaccharide polymer materials suitable for use herein include those of the formula:

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wherein: A is an anhydroglucose residual group, such as starch or cellulose anhydroglucose residual, R is an alkylene oxyalkylene, polyoxyalkylene, or hydroxyalkylene group, or combination thereof, R<sup>1</sup>, R<sup>2</sup> and R<sup>3</sup> independently are alkyl, aryl, alkylaryl, arylalkyl, alkoxyalkyl, or alkoxyaryl groups,  
 20 each group containing up to about 18 carbon atoms, and the total number of carbon atoms for each cationic moiety (i.e., the sum of carbon atoms in R<sup>1</sup>, R<sup>2</sup> and R<sup>3</sup>) preferably being about 20 or less, and X is an anionic counterion, as previously described.

Cationic cellulose is available from Amerchol Corp. (Edison, NJ, USA) in their Polymer JR (trademark) and LR (trade mark) series of polymers, as salts of hydroxyethyl cellulose reacted with trimethyl ammonium substituted epoxide, referred to in the industry (CTFA) as Polyquaternium 10.   
 25 Another type of cationic cellulose includes the polymeric quaternary ammonium salts of hydroxyethyl cellulose reacted with lauryl dimethyl ammonium-substituted epoxide, referred to in the industry (CTFA) as Polyquaternium 24. These materials are available from Amerchol Corp. (Edison, NJ, USA) under the tradename Polymer LM-200.

30 Other cationic polymers that can be used include cationic guar gum derivatives, such as guar hydroxypropyltrimonium chloride (commercially available from Celanese Corp. in their Jaguar  trade mark series). Other materials include quaternary nitrogen-containing cellulose ethers (e.g., as described in U.S. Patent 3,962,418, incorporated by reference herein), and copolymers of etherified cellulose and starch (e.g., as described in U.S. Patent 3,958,581, incorporated by reference herein).

The deposition polymer does not have to be soluble in the shampoo composition. Preferably, however, the cationic polymer is either soluble in the shampoo composition, or in a complex coacervate phase in the shampoo composition formed by the cationic polymer and anionic material. Complex coacervates of the cationic polymer can be formed with anionic surfactants or  
5 with anionic polymers that can optionally be added to the composition hereof (e.g., sodium polystyrene sulfonate).

Coacervate formation is dependent upon a variety of criteria such as molecular weight, concentration, and ratio of interacting ionic materials, ionic strength (including modification of ionic strength, for example, by addition of salts), charge density of the cationic and anionic species, pH,  
10 and temperature. Coacervate systems and the effect of these parameters have been described, for example, by J. Caelles, et al., "Anionic and Cationic Compounds in Mixed Systems", *Cosmetics & Toiletries*, Vol. 106, April 1991, pp 49-54, C. J. van Oss, "Coacervation, Complex-Coacervation and Flocculation", *J. Dispersion Science and Technology*, Vol. 9 (5,6), 1988-89, pp 561-573, and D. J. Burgess, "Practical Analysis of Complex Coacervate Systems", *J. of Colloid and Interface Science*,  
15 Vol. 140, No. 1, November 1990, pp 227-238, which descriptions are incorporated herein by reference.

It is believe to be particularly advantageous for the cationic polymer to be present in the shampoo in a coacervate phase, or to form a coacervate phase upon application or rinsing of the shampoo to or from the hair. Complex coacervates are believed to more readily deposit on the hair.  
20 Thus, in general, it is preferred that the cationic polymer exist in the shampoo as a coacervate phase or form a coacervate phase upon dilution. If not already a coacervate in the shampoo, the cationic polymer will preferably exist in a complex coacervate form in the shampoo upon dilution with water to a water:shampoo composition rate ratio of about 20:1, more preferably at about 10:1, even more preferably at about 8:1.

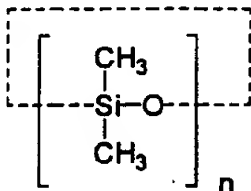
Techniques for analysis of formation of complex coacervates are known in the art. For example, microscopic analyses of the shampoo compositions, at any chosen stage of dilution, can be utilized to identify whether a coacervate phase has formed. Such coacervate phase will be identifiable as an additional emulsified phase in the composition. The use of dyes can aid in distinguishing the coacervate phase from other insoluble phase dispersed in the composition.  
25

Preferably the deposition polymer is selected from the group comprising hydroxyalkyl cellulose ethers and cationic guar derivatives. Particularly preferred deposition polymers are Jaguar C13S, Jaguar C15, Jaguar C17 and Jaguar C16 and Jaguar C162. Other preferred cellulose ethers include Polymer JR400, JR30M and JR125.  
30

### Emulsion Polymerized Silicone Polymers

The shampoo compositions of the present invention comprise non-volatile silicone emulsion polymers derived from emulsion polymerization of linear dimethylpolysiloxane monomers. The concentrations of the emulsified silicones generally range from about 0.005% to about 10%, preferably from about 0.05% to about 5%, more preferably from about 0.1% to about 4%, and most preferably from about 0.2% to about 3%. The shampoo compositions preferably comprise dimethiconol. The dimethiconol silicone can either be used as such or it can be end-capped with a further methyl group. The emulsion polymerized silicone can also contain organo-functional groups (amines, esters, quats, etc.). Emulsion polymerized silicones are known in the art, and are disclosed in U.S. Patents 2,891,920, 3,294,725, and 3,360,491, all of which are incorporated by reference herein in their entirety. Emulsion polymerized dimethylpolysiloxane microemulsions are described in E.P. Patent 268,982, which is incorporated herein by reference.

The most common method for emulsion polymerized silicones involves the emulsification of cyclic organopolysiloxanes corresponding to the following formula:



wherein n is from about 3 to about 7, preferably from about 3 to about 5. The emulsified organopolysiloxanes are then polymerized into high viscosity silicone fluids. This process is actually an equilibrium process whereby about 10-15% of the cyclic silicone is left in the emulsion phase.

The shampoo composition of the present invention is preferably substantially free of emulsion polymerized silicones derived from cyclic organopolysiloxanes. As used herein, the term "substantially free" means the composition comprises less than about 1%, more preferably less than about 0.5%, even more preferably less than about 0.2%, even more preferably less than about 0.1% and most preferably less than about 0.05% of emulsion polymerized silicones derived from cyclic organopolysiloxanes.

Another emulsion polymerization method for the manufacture of high viscosity silicone emulsions involves the emulsification of low molecular weight linear organopolysiloxanes corresponding to the formula:



wherein  $\text{R}_1$  and  $\text{R}_2$  are the same or different and are selected from the group consisting of  $\text{CH}_3$ , organofunctional alkyls and alkyl radicals which are linear or branched and have from about 1 to 22 carbon atoms; and n is greater than about 10 to about 100, preferably greater than about 15 to about

100, more preferably greater than about 20 to about 75, even more preferably greater than about 20 to about 50. The linear organopolysiloxane is then polymerized, via condensation reactions, yielding high viscosity silicone polymers.

Without being limited by theory, Applicants believe that emulsion polymerized silicone emulsions which are made using cyclic silicones can negatively impact lather of conditioning shampoo compositions. However, silicone emulsions derived from the polymerization of linear dimethylpolysiloxanes are able to be added to conditioning shampoo compositions with minimal lather suppression. While wishing to not be limited by theory, Applicants further believe that the residual cyclic silicone leaches from the emulsion phase to the surfactant phase and acts as an antifoam or soil load, thereby reducing lather performance. The emulsion polymerized silicone emulsions which are derived from condensation polymerization of polymerization of linear dimethylpolysiloxanes do not exhibit the negative impact on lather of conditioning shampoo compositions due to a higher completeness of the reaction and the starting material is of sufficient molecular weight to prevent leaching into the surfactant phase.

The emulsion polymerized silicone derived from linear low molecular weight organopolysiloxanes of the present invention provide the shampoo compositions with uniform deposition, thereby providing conditioning benefits such as wet and dry combing, and dry hair feel. Moreover the emulsion polymerized silicone derived from linear low molecular weight organopolysiloxanes can be included in the shampoo composition with minimal suppression of the shampoo lather. The average particle size of the emulsion polymerized silicone derived from linear low molecular weight organopolysiloxanes are preferably less than about 2 $\mu$ m, preferably less than about 1 $\mu$ m, more preferably less than about 0.5 $\mu$ m, even more preferably less than about 0.3 $\mu$ m, even more preferably less than about 0.15 $\mu$ m, and most preferably less than about 0.1 $\mu$ m.

#### Water

The shampoo compositions of the present invention are aqueous systems which comprise from about 20% to about 94%, preferably from about 50% to about 90%, more preferably from about 60% to about 85%, water by weight of the composition.

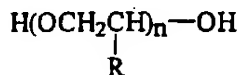
#### Optional Components

In addition to the essential components described hereinbefore, the shampoo compositions of the present invention may further comprise one or more optional components known for use in hair care or personal care products, provided that the optional components are physically and chemically compatible with the essential component described herein, or do not otherwise unduly impair product stability, aesthetics or performance. Nonlimiting examples of such optional components are disclosed in *International Cosmetic Ingredient Dictionary*, Fifth Edition, 1993, and *CTFA Cosmetic Ingredient Handbook*, Second Edition, 1992, both of which are incorporated by reference herein in their entirety. Some nonlimiting examples of such optional components are disclosed below.

Polyalkylene Glycols

The shampoo composition may further comprise a polyalkylene glycol to improve lather performance. Concentration of the polyalkylene glycol in the shampoo composition may range from about 0.01% to about 5%, preferably from about 0.05% to about 3%, and more preferably from about 0.1% to about 2%, by weight of the composition.

The optional polyalkylene glycols are characterized by the general formula:



wherein R is selected from the group consisting of H, methyl, and mixtures thereof. When R is H, these materials are polymers of ethylene oxide, which are also known as polyethylene oxides, polyoxyethylenes, and polyethylene glycols. When R is methyl, these materials are polymers of propylene oxide, which are also known as polypropylene oxides, polyoxypropylenes, and polypropylene glycols. When R is methyl, it is also understood that various positional isomers of the resulting polymers can exist.

In the above structure, n has an average value of from about 1500 to about 25,000, preferably from about 2500 to about 20,000, and more preferably from about 3500 to about 15,000.

Polyethylene glycol polymers useful herein are PEG-2M wherein R equals H and n has an average value of about 2,000 (PEG-2M is also known as Polyox WSR® N-10, which is available from Union Carbide and as PEG-2,000); PEG-5M wherein R equals H and n has an average value of about 5,000 (PEG-5M is also known as Polyox WSR® N-35 and Polyox WSR® N-80, both available from Union Carbide and as PEG-5,000 and Polyethylene Glycol 300,000); PEG-7M wherein R equals H and n has an average value of about 7,000 (PEG-7M is also known as Polyox WSR® N-750 available from Union Carbide); PEG-9M wherein R equals H and n has an average value of about 9,000 (PEG 9-M is also known as Polyox WSR® N-3333 available from Union Carbide); and PEG-14 M wherein R equals H and n has an average value of about 14,000 (PEG-14M is also known as Polyox WSR® N-3000 available from Union Carbide).

Other useful polymers include the polypropylene glycols and mixed polyethylene/polypropylene glycols.

Suspending Agents

The shampoo compositions of the present invention may further comprise a suspending agent at concentrations effective for suspending the preferred silicone conditioning agent, or other water-insoluble material, in dispersed form in the shampoo compositions. Such concentrations range from about 0.1% to about 10%, preferably from about 0.3% to about 5.0%, by weight of the shampoo compositions.

Optional suspending agents include crystalline suspending agents which can be categorized as acyl derivatives, long chain amine oxides, and mixtures thereof, concentrations of which range



from about 0.1% to about 5.0%, preferably from about 0.5% to about 3.0%, by weight of the shampoo compositions. These suspending agents are described in U.S. Patent 4,741,855, which description is incorporated herein by reference. These preferred suspending agents include ethylene glycol esters of fatty acids preferably having from about 16 to about 22 carbon atoms. More preferred are the ethylene glycol stearates, both mono and distearate, but particularly the distearate containing less than about 7% of the mono stearate. Other suitable suspending agents include alkanol amides of fatty acids, preferably having from about 16 to about 22 carbon atoms, more preferably about 16 to 18 carbon atoms, preferred examples of which include stearic monoethanolamide, stearic diethanolamide, stearic monoisopropanolamide and stearic monoethanolamide stearate. Other long chain acyl derivatives include long chain esters of long chain fatty acids (e.g., stearyl stearate, cetyl palmitate, etc.); glyceryl esters (e.g., glyceryl distearate) and long chain esters of long chain alkanol amides (e.g., stearamide diethanolamide distearate, stearamide monoethanolamide stearate). Long chain acyl derivatives, ethylene glycol esters of long chain carboxylic acids, long chain amine oxides, and alkanol amides of long chain carboxylic acids in addition to the preferred materials listed above may be used as suspending agents. For example, it is contemplated that suspending agents with long chain hydrocarbyls having C<sub>8</sub>-C<sub>22</sub> chains may be used.

Other long chain acyl derivatives suitable for use as suspending agents include N,N-dihydrocarbyl amido benzoic acid and soluble salts thereof (e.g., Na, K), particularly N,N-di(hydrogenated) C<sub>16</sub>, C<sub>18</sub> and tallow amido benzoic acid species of this family, which are commercially available from Stepan Company (Northfield, Illinois, USA).

Examples of suitable long chain amine oxides for use as suspending agents include alkyl (C<sub>16</sub>-C<sub>22</sub>) dimethyl amine oxides, e.g., stearyl dimethyl amine oxide

Other suitable suspending agents include xanthan gum at concentrations ranging from about 0.3% to about 3%, preferably from about 0.4% to about 1.2%, by weight of the shampoo compositions. The use of xanthan gum as a suspending agent in silicone containing shampoo compositions is described, for example, in U.S. Patent 4,788,006, which description is incorporated herein by reference. Combinations of long chain acyl derivatives and xanthan gum may also be used as a suspending agent in the shampoo compositions. Such combinations are described in U.S. Patent 4,704,272, which description is incorporated herein by reference.

Other suitable suspending agents include carboxyvinyl polymers. Preferred among these polymers are the copolymers of acrylic acid crosslinked with polyallylsucrose as described in U.S. Patent 2,798,053, which description is incorporated herein by reference. Examples of these polymers include Carbopol 934, 940, 941, and 956, available from B. F. Goodrich Company.

Other suitable suspending agents include primary amines having a fatty alkyl moiety having at least about 16 carbon atoms, examples of which include palmitamine or stearamine, and secondary amines having two fatty alkyl moieties each having at least about 12 carbon atoms,

examples of which include dipalmitoylamine or di(hydrogenated tallow)amine. Still other suitable suspending agents include di(hydrogenated tallow)phthalic acid amide, and crosslinked maleic anhydride-methyl vinyl ether copolymer.

Other suitable suspending agents may be used in the shampoo compositions, including those that can impart a gel-like viscosity to the composition, such as water soluble or colloiddally water soluble polymers like cellulose ethers (e.g., methylcellulose, hydroxybutyl methylcellulose, hydroxypropylcellulose, hydroxypropyl methylcellulose, hydroxyethyl ethylcellulose and hydroxyethylcellulose), guar gum, polyvinyl alcohol, polyvinyl pyrrolidone, hydroxypropyl guar gum, starch and starch derivatives, and other thickeners, viscosity modifiers, gelling agents, etc.

10 Mixtures of these materials can also be used.

#### Other Optional Materials

Other optional materials suitable for use in the shampoo compositions of the present invention include, but are not limited to, preservatives such as benzyl alcohol, benzoic acid, methyl paraben, propyl paraben, imidazolidinyl urea, iodopropynyl butyl carbamate, methylisothiazolinone, methylchloroisothiazolinone; salts and electrolytes such as sodium chloride, potassium chloride, and sodium sulfate; ammonium xylene sulfonate; propylene glycol; polyvinyl alcohol; ethyl alcohol; pH adjusting agents such as citric acid, succinic acid, phosphoric acid, sodium hydroxide, and sodium carbonate; fragrances and colorings to modify the aesthetic appeal of the composition; hydrogen peroxide; sunscreens agents; hair coloring agents; humectants such as glycerol and other polyhydric alcohols; moisturizers; humectants; anti-oxidants; and chelating agents such as EDTA; anti-inflammatory agents; steroids; topical anesthetics; and scalp sensates such as menthol. Cationic conditioning polymers may also be used in the shampoo compositions.

20

Synthetic esters may also be used in the shampoo composition to provide improved wet hair feel when used in combination with the essential components of the shampoo composition herein, and in particular when used in combination with the organic conditioning oil described hereinbefore. The concentration of the synthetic esters in the shampoo composition may range from about 0.01% to about 1.0%, preferably from about 0.05% to about 0.5%, more preferably from about 0.08% to about 0.3%, by weight of the composition.

25

Antidandruff agents may also be used in the shampoo compositions. These agents include particulate antidandruff agents such as pyridinethione salts, selenium compounds such as selenium disulfide, and soluble antidandruff agents. The concentration of antidandruff agents in the shampoo composition may range from about 0.1% to about 4% and preferably about 0.2% to about 2%, by weight of the composition.

30

Pediculicides can also be used in the shampoo compositions for control of lice infestations. Suitable pediculicides are well known in the art and include, for example, pyrethrins such as those described in U.S. Patent 4,668,666, which description is incorporated herein by reference in its entirety.

35

### Method of Use

The shampoo compositions of the present invention are used in a conventional manner for cleansing and conditioning hair or skin. An effective amount of the composition for cleansing and conditioning the hair or skin is applied to the hair or skin, that has preferably been wetted with water, and then rinsed off. Such effective amounts generally range from about 1g to about 50g, preferably from about 1g to about 20g. Application to the hair typically includes working the composition through the hair such that most or all of the hair is contacted with the composition.

This method for cleansing and conditioning the hair comprises the steps of:

- a) wetting the hair with water, b) applying an effective amount of the shampoo composition to the hair, c) shampooing the hair with the composition, and d) rinsing the shampoo composition from the hair using water. These steps can be repeated as many times as desired to achieve the desired cleansing and conditioning benefit.

### Examples

The following examples further describe and demonstrate embodiments within the scope of the present invention. The examples are given solely for the purpose of illustration and are not to be construed as limitations of the present invention, as many variations thereof are possible without departing from the spirit and scope of the invention. These exemplified embodiments of the shampoo compositions of the present invention provide cleansing of hair and improved hair conditioning performance. Ingredients are hereinafter identified by chemical, trade, or CTFA name.

#### Preparation

The shampoo compositions of the present invention can be prepared by using conventional mixing and formulating techniques. The shampoo compositions illustrated hereinafter in Examples I-XV are prepared in the following manner.

About one-third to all of the total alkyl sulfate surfactant (ammonium laureth-3 sulfate (added as a 25% solution) and/or ammonium lauryl sulfate (added as a 25% solution)) is added to a jacketed mix tank and heated to about 74°C with slow agitation to form a surfactant solution. Cocamide MEA and fatty alcohol, as applicable, are added to the tank and allowed to disperse. Ethylene glycol distearate (EGDS), as applicable, is then added to the mixing vessel, and melted. After the EGDS is well dispersed (usually about 5 to 20 minutes) polyethylene glycol and the preservative, if used are added and mixed into the surfactant solution. This mixture is passed through a heat exchanger where it is cooled to about 35°C and collected in a finishing tank. As a result of this cooling step, the ethylene glycol distearate crystallizes to form a crystalline network in the product. The remainder of the ammonium laureth sulfate, lauryl sulfate and other ingredients including the silicone emulsions are added to the finishing tank with ample agitation to insure a homogeneous mixture. A sufficient amount of the silicone emulsions are added to provide the desired level of dimethicone in the final product. Water dispersible polymers are typically dispersed in water as a 1% to 10% solution before addition to the final mix. Once all ingredients have been

added, ammonium xylene sulfonate or additional sodium chloride can be added to the mixture to thin or thicken respectively to achieve a desired product viscosity. Preferred viscosities range from about 2500 to about 9000 cS at 25°C (as measured by a Wells-Brookfield cone and plate viscometer at 15/s).

5

<u>Component</u>	<u>Example Number</u>				
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>
Ammonium Laurel Sulfate	2	4	4	5	4
Ammonium Laureth-3 Sulfate	8	6	12	10	12
Cocamidopropylbetaine	0	0	2.5	0	1
Jaguar C17 (5)	0.05	0.05	0.05	0.30	0.15
Cocamide MEA	0.5	0.5	0.80	0.80	0
Cetyl Alcohol	0	0	0.42	0.42	0.42
Stearyl Alcohol	0	0	0.18	0.18	0.18
Ethylene Glycol Distearate	1.50	1.50	1.50	1.50	1.50
EP Silicone (1)	3.0	2.5	3.0	2.0	3.0
Perfume Solution	0.70	0.70	0.70	0.70	0.70
DMDM Hydantoin	0.37	0.37	0.37	0.37	0.37
Color Solution (ppm)	64	64	64	64	64
Water and Minors	----- q.s. to 100% -----				

<u>Component</u>	<u>Example Number</u>				
	<u>VI</u>	<u>VII</u>	<u>VIII</u>	<u>IX</u>	<u>X</u>
Ammonium Laureth-3 Sulfate	9.00	9.00	14.0	14.85	12.50
Cocamidopropylbetaine	1.70	1.70	2.70	1.85	4.20
Polyquaternium-10 (3)	0.05	0.02	0.15	0.15	0.15
Cocamide MEA	0.80	0.80	0.80	0.80	0
Cetyl Alcohol	0	0	0.42	0.42	0.42
Stearyl Alcohol	0	0	0.18	0.18	0.18
Ethylene Glycol Distearate	1.50	1.50	1.50	1.50	1.50
EP Silicone (4)	3.0	2.5	3.0	2.0	3.0
Perfume Solution	0.70	0.70	0.70	0.70	0.70
DMDM Hydantoin	0.37	0.37	0.37	0.37	0.37
Color Solution (ppm)	64	64	64	64	64
Water and Minors	----- q.s. to 100% -----				

<u>Component</u>	<u>Example Number</u>				
	<u>XI</u>	<u>XII</u>	<u>XIII</u>	<u>XIV</u>	<u>XV</u>
Ammonium Laureth-3 Sulfate	14.0	14.00	14.00	9.00	9.00
Cocamidopropylbetaine	2.70	2.70	2.70	1.70	1.70
Polyquaternium-10 (6)	0.	0.15	0.15	0.05	0.02
Cocamide MEA	0.80	0.80	0	0.80	0.80
Cetyl Alcohol	0	0.42	0	0	0
Stearyl Alcohol	0	0.18	0	0	0
Ethylene Glycol Distearate	0	0	0	1.50	1.50
Carbopol 981 (2)	0.50	0.50	0.50	0	0
EP Silicone (1)	3.0	2.5	3.0	2.0	3.0
Perfume Solution	0.70	0.70	0.70	0.70	0.70
DMDM Hydantoin	0.37	0.37	0.37	0.37	0.37
Color Solution (ppm)	64	64	64	64	64
Water and Minors	----- q.s. to 100% -----				

5 (1) EP Silicone is an experimental emulsion polymerized polydimethyl siloxane of about 97,000 csk with particle size of approximately 300 nm made via linear feedstock available from Dow Corning (2-1520; 13556-34).

(2) Carbopol 981 is a crosslinked polyacrylate available from B.F. Goodrich.

10 (3) Polyquaternium-10 is JR30M, a cationic cellulose derived polymer available from Amerchol.

(4) EP Silicone is an experimental emulsion polymerized polydimethyl siloxane of about 335,000 csk with particle size of approximately 500 nm made via linear feedstock available from Dow Corning (2-1520; PE106004).

15 (5) Jaguar C17 is a cationic polymer available from Rhone-Poulenc

(6) Polyquaternium-10 is JR400, a cationic cellulose derived polymer available from Amerchol.

20 The shampoo composition illustrated in Examples I-XV, all of which are embodiments of the present invention, provide excellent cleansing, lather, mildness, dandruff control (where applicable), and conditioning of hair, especially conditioning and conditioning impression.

## WHAT IS CLAIMED IS:

## 1. A conditioning shampoo composition comprising:

- 5 (a) from 5% to 50%, preferably from 8% to 30%, by weight of an anionic surfactant component selected from the group consisting of anionic surfactants, zwitterionic and amphoteric surfactants, said zwitterionic and amphoteric surfactants having an attached group that is anionic at the pH of the composition, and combinations thereof;
- 10 (b) from 0.025% to 3% by weight of an organic, cationic, deposition polymer having a cationic charge density of from 0.2 meq/g to 5meq/g, preferably from 0.8meq/g to 2.0meq/g, and an average molecular weight of from 5,000 to 10,000,000;
- (c) from 0.005% to 10% by weight of an emulsion polymerized silicone wherein the polymer is derived from the polymerization of linear dimethylpolysiloxane monomers having the formula:
- 15 
$$\text{HO}-(\text{Si}(\text{R}^1\text{R}^2)-\text{O})_n-\text{H}$$
wherein  $\text{R}_1$  and  $\text{R}_2$  are the same or different and are  $\text{CH}_3$ , or organofunctional alkyls or alkyl radicals which are linear or branched and have from 1 to 22 carbon atoms, and  $n$  is from 10 to 100, preferably greater than 15 to 50; and
- 20 (d) from 20% to 94% by weight of water.

2. The composition of Claim 1 wherein the organic cationic deposition polymer is selected from the group consisting of cationic cellulose derivatives, cationic starch derivatives, cationic guar gum derivatives, and mixtures thereof.

25 3. The composition of any one of the preceding claims wherein the composition comprises less than 0.5%, preferably less than 0.2%, of emulsion polymerized silicones derived from cyclic organopolysiloxanes.

30 4. The composition of any one of the preceding claims wherein the emulsion polymerized silicone has an average particle size from 0.01 $\mu\text{m}$  to 2 $\mu\text{m}$ , preferably from 0.01 $\mu\text{m}$  to 0.5 $\mu\text{m}$ .

5. A process for the preparation of a conditioning shampoo composition wherein said process comprises the steps of:

- 35 (a) preparing an emulsion polymerized silicone wherein the polymer is derived from the polymerization of linear dimethylpolysiloxane monomers having the formula:



wherein  $R_1$  and  $R_2$  are the same or different and are  $CH_3$ , or organofunctional alkyls or alkyl radicals which are linear or branched and have from 1 to 22 carbon atoms, and  $n$  is from 10 to 100, preferably greater than 15 to 50; and

40 (b) mixing from 0.005% to 10% of the emulsion polymerized silicone with the following components:

- i) from 5% to 50%, preferably from 8% to 30%, by weight of an anionic surfactant,
- ii) from 20% to 94% by weight of water, and
- 45 iii) from 0.025% to 3% by weight of an organic, cationic, deposition polymer.

6. The composition of Claim 5 wherein the organic cationic deposition polymer has a cationic charge density of from about 0.8 meq/g to about 2.0 meq/g.

7. The composition of Claim 5 or 6 wherein the organic cationic deposition polymer is selected  
50 from the group consisting of cationic cellulose derivatives, cationic starch derivatives, cationic guar gum derivatives, and mixtures thereof.

8. The composition of any one of Claims 5, 6, or 7 wherein the composition comprises less than 0.5%, preferably less than 0.2%, of emulsion polymerized silicones derived from cyclic  
55 organopolysiloxanes.

9. The composition of any one of Claims 5, 6, 7, or 8 wherein the emulsion polymerized silicone has an average particle size from 0.01  $\mu m$  to 2  $\mu m$ , preferably from 0.1  $\mu m$  to 0.5  $\mu m$ .

# INTERNATIONAL SEARCH REPORT

Int. l. Application No.

PCT/US 97/19273

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 A61K7/06 A61K7/50

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 432 951 A (UNILEVER PLC ;UNILEVER NV (NL)) 19 June 1991 see the whole document ---	1-4,6,7, 9
X	WO 93 08787 A (PROCTER & GAMBLE) 13 May 1993 see the whole document ---	1,2,6,7
X	EP 0 400 976 A (UNILEVER PLC ;UNILEVER NV (NL)) 5 December 1990 see the whole document ---	1,2,7
X	EP 0 529 883 A (UNILEVER PLC ;UNILEVER NV (NL)) 3 March 1993 see the whole document ---	1,2,7
-/-		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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# INTERNATIONAL SEARCH REPORT

Int'l. Application No.

PCT/US 97/19273

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 468 721 A (UNILEVER PLC ;UNILEVER NV (NL)) 29 January 1992 see the whole document	1,2,7
A	WO 96 32919 A (PROCTER & GAMBLE) 24 October 1996 see the whole document	1-4,6-9
A	WO 95 09600 A (PROCTER & GAMBLE) 13 April 1995 see the whole document	1-4,6-9
P,A	WO 97 35542 A (PROCTER & GAMBLE) 2 October 1997 see the whole document	1-4,6-9
P,A	WO 97 35545 A (PROCTER & GAMBLE) 2 October 1997 see the whole document	1-4,6-9

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 97/19273

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0432951 A	19-06-91	AU 620746 B	20-02-92
		AU 6772590 A	06-06-91
		CA 2031382 A,C	05-06-91
		DE 69004057 D	25-11-93
		DE 69004057 T	17-02-94
		ES 2060070 T	16-11-94
		IN 171189 A	15-08-92
		JP 1997997 C	08-12-95
		JP 4364111 A	16-12-92
		JP 7017491 B	01-03-95
		JP 4036226 A	06-02-92
		JP 6062392 B	17-08-94
		US 5085857 A	04-02-92
WO 9308787 A	13-05-93	AT 141784 T	15-09-96
		AU 674834 B	16-01-97
		AU 2927292 A	07-06-93
		BR 9206689 A	02-05-95
		CA 2120492 A	13-05-93
		CN 1072589 A	02-06-93
		CZ 9401025 A	19-10-94
		DE 69213247 D	02-10-96
		DE 69213247 T	27-03-97
		EP 0610407 A	17-08-94
		ES 2090702 T	16-10-96
		FI 941969 A	28-04-94
		HU 67994 A	14-03-95
		JP 7500609 T	19-01-95
		MX 9206228 A	01-05-93
		NO 941535 A	28-06-94
		NZ 244925 A	21-12-95
EP 0400976 A	05-12-90	PT 101011 A	28-02-94
		SK 46094 A	08-03-95
		AU 624514 B	11-06-92
		AU 5606690 A	06-12-90
		CA 2017672 A,C	30-11-90
		DE 69005704 D	17-02-94
		DE 69005704 T	19-05-94
		ES 2062365 T	16-12-94

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. Patent Application No.

PCT/US 97/19273

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0400976 A		IN 172894 A JP 3068509 A JP 4000964 B KR 9503086 B US 5152914 A	25-12-93 25-03-91 09-01-92 01-04-95 06-10-92
EP 0529883 A	03-03-93	AT 147964 T AU 651236 B AU 2104092 A CA 2075767 A DE 69216953 D DE 69216953 T ES 2098453 T JP 5194142 A JP 7080740 B KR 9615951 B ZA 9206141 A	15-02-97 14-07-94 18-02-93 17-02-93 06-03-97 12-06-97 01-05-97 03-08-93 30-08-95 25-11-96 14-02-94
EP 0468721 A	29-01-92	AT 116841 T AU 639351 B AU 8118291 A CA 2047105 A,C DE 69106618 D DE 69106618 T ES 2067873 T GB 2246575 A IN 173461 A JP 4234309 A JP 6069943 B KR 9611565 B US 5246694 A	15-01-95 22-07-93 30-01-92 24-01-92 23-02-95 18-05-95 01-04-95 05-02-92 14-05-94 24-08-92 07-09-94 24-08-96 21-09-93
WO 9632919 A	24-10-96	AU 5528596 A EP 0821579 A	07-11-96 04-02-98
WO 9509600 A	13-04-95	NONE	
WO 9735542 A	02-10-97	AU 2319997 A	17-10-97
WO 9735545 A	02-10-97	AU 2319897 A	17-10-97

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